Chapman's Quillwort Reconsidered

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Certainly one of the least known pteridophytes in the southeastern United States is Chapman's Quillwort. Described by Engelmann (1882) as *Isoëtes flaccida* Shuttlew. var. *chapmanii* Engelm., the taxon has been collected only a few times since its initial collection by A. W. Chapman in 1848. The collections are always from the same general locality in Jackson County, Florida. Larger megaspores with smoother ornamentation were said by Engelmann to distinguish it from the typical variety.

Underwood (1900) and Clute (1928) both recognized the distinctness of the taxon, and Small (1932) even elevated it to specific status. Lakela and Long (1976) maintained *I. chapmanii* (Engelm.) Small, and in their key distinguished it from *I. flaccida* on the basis of megaspore ornamentation and sporangium shape. On the other hand, Pfeiffer (1922) and Boom (1979, 1982) were not convinced of the distinctness of *I. chapmanii*, and they synonymized it with *I. flaccida*. Recently I was able to study the spores of these plants more carefully by means of scanning electron microscopy (SEM), and I now regard the evidence as sufficient for maintaining *I. flaccida* var. *chapmanii* as a rare, but distinct element of Florida's pteridophyte flora.

Spores were coated by a two-step procedure consisting of the deposition from a low voltage arc of an initial carbon layer onto which was subsequently sputtered a 60:40 gold-palladium alloy using a 15 watt DC diode coater. Specimens were examined with a Cambridge S4-10 SEM. Photographs were taken with Polaroid Type 665 Positive/Negative Land Film. Spores of some thirty specimens of *Isoëtes flaccida* were examined (vouchers cited in Boom, 1979), but the photomicrographs of only three are presented herein: var. *flaccida:* Lake Flirt, near Lake Okeechobee, Florida, Aug 1878, *A. P. Garber s. n.* (US 240797); cypress pond near Cobb, Sumter Co., Georgia, *R. M. Harper 1046* (US 400120); and var. *chapmanii:* Tributary of the Chipola River at Marianna, Jackson Co., Florida, *R. K. Godfrey 61963* (US 2424571).

Both megaspores and microspores of the two varieties show differences in perine ornamentation which are taxonomically significant (*Figs. 1–6*). Additionally, the differences in megaspore size provide a useful means of distinguishing the varieties.

The ornamentation of *I. flaccida* var. *chapmanii* megaspores is low tuberculate, densely so on the distal hemisphere and sparsely so on the proximal (*Fig. 1*). Greater magnification shows the perine to be minutely echinate (*Fig. 3*). In var. *flaccida*, the megaspores are also low tuberculate, but densely so on both hemispheres (*Fig. 2*). Greater magnification reveals a finely rugulate perine, the muri anastomosing so as to give a spongy appearance (*Fig. 4*). The diagnostic perine characters (extent and distribution of tubercules) can be seen at 40X, and the size difference detected with a dissecting microscope.

Although the microspores of the varieties are essentially the same size, their perine ornamentation differs: that of var. *chapmanii* being echinate with an arach-

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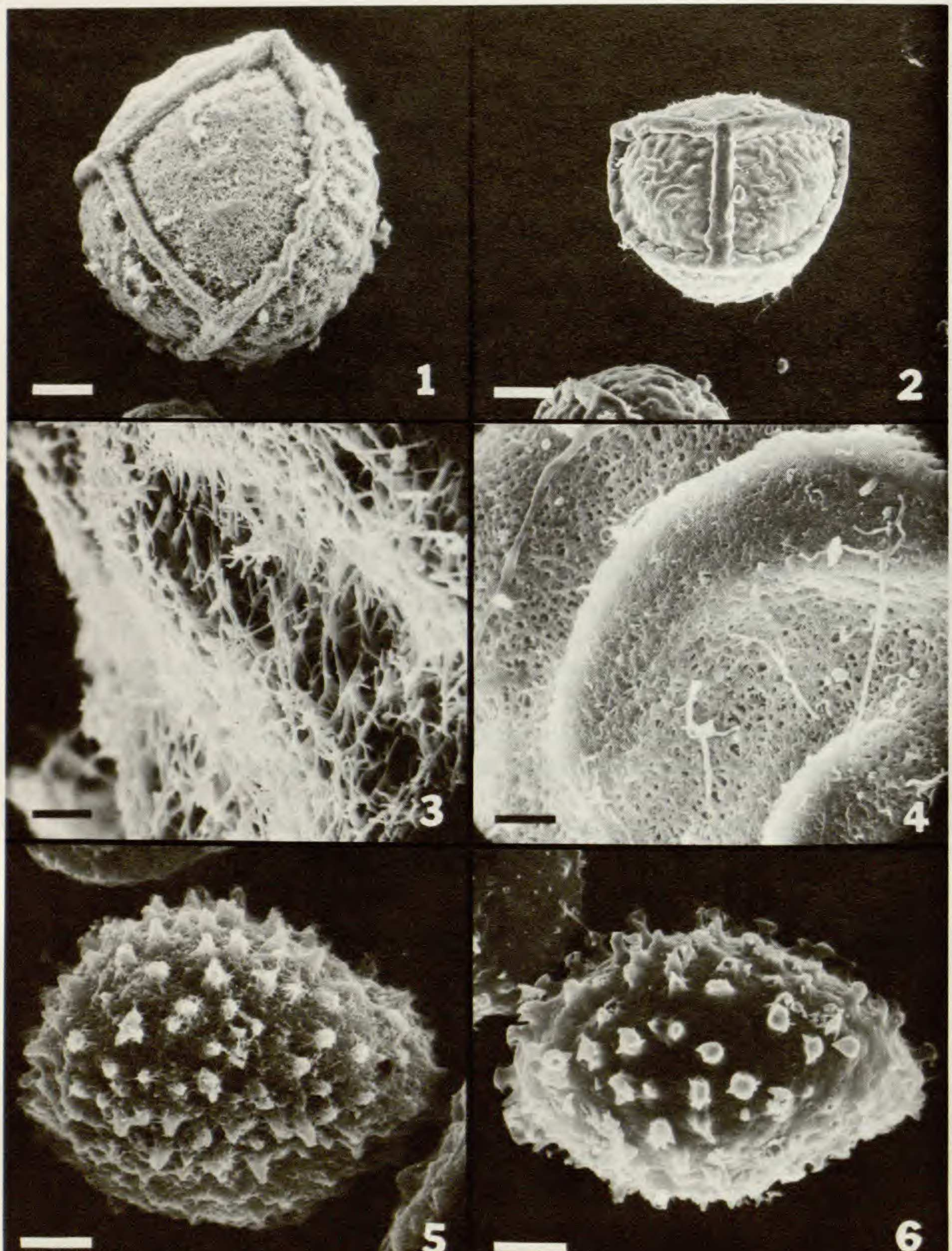

FIGS. 1–6. *Isoëtes flaccida* spores. FIG. 1. Megaspore of var. *chapmanii* (US 2424571); scale = 100 μm. FIG. 2. Megaspore of var. *flaccida* (US 240797); scale = 100 μm. FIG. 3. Megaspore perine of var. *chapmanii* (US 2424571); scale = 7 μm. FIG. 4. Megaspore perine of var. *flaccida* (US 240797); scale = 7 μm. FIG. 5. Microspore of var. *chapmanii* (US 2424571); scale = 5 μm. FIG. 6. Microspore of var. *flaccida* (US 400120); scale = 5 μm.

noid perine between echinae (*Fig. 5*), and that of var. *flaccida* being papillate with a laevigate perine between papillae (*Fig. 6*). Given their average size of ca. 30 μm, the microspores do not provide useful taxonomic characters for the field or herbarium botanist, but the ornamentation differences help confirm their distinctness.

Aside from the spore characters, there are no other apparent morphological, chemical, or ecological differences that separate the varieties. The orbicular or obovoid sporangium ascribed to var. *chapmanii* by some authors (Engelmann, 1882; Small, 1932; Lakela & Long, 1976) as a feature distinguishing it from var. *flaccida* (with an oval, ellipsoid, or subglobose sporangium) is not a good character, as this structure varies too much depending on plant size and ecological conditions. The flavonoid chemistry of the two varieties was examined by Boom (1979), but the chromatographic profiles were identical. Ecologically, there appears to be nothing striking about the habitat of var. *chapmanii*. A topotype collection (*Boom 333*, TENN) reports "sandy/peaty substrate, clear water in deep bald cypress swamp;" the stream is underlain by limestone. This general description could apply to many areas in Florida where var. *flaccida* occurs, but perhaps there are significant microhabitat factors involved which have not yet been detected. A distribution map of *I. flaccida* is given in Boom (1982).

Just as Taylor et al. (1975) used SEM to confirm the distinctness of *Isoëtes butleri* Engelm. from *I. melanopoda* Gay & Dur. based on spore ornamentation, it has been possible to show that two entities are encompassed by *I. flaccida*. I prefer to recognize these two taxa at the varietal level because, unlike the case of *I. butleri* and *I. melanopoda*, the two taxa involved here are not ecologically or geographically differentiated. I do not regard *I. flaccida* var. *chapmanii* as a hybrid because it meets none of the criteria used in the detection of several instances of hybridization in other southeastern U.S. quillworts (Boom, 1982). I consider *I. flaccida* var. *flaccida* to encompass *I. alata* Small and *I. flaccida* var. *rigida* Engelm. The following key separates the two recognized varieties of the species:

KEY TO VARIETIES OF ISOËTES FLACCIDA

Megaspores 300–400(440) μm diam., densely low tuberculate on both hemispheres; microspores papillate; common throughout Florida and southern Georgia ..... var. *flaccida*

Megaspores 440–540 μm diam., densely low tuberculate on distal hemisphere, sparingly so on proximal; microspores echinate; rare in northwestern Florida (Jackson Co.) ..... var. *chapmanii*

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REVIEW

Flora Malesiana, Series II–Pteridophyta, volume 2, part 5, Thelypteridaceae, by R. E. Holttum. Pp. 331–599, including index and addenda for entire volume, plus pp. 1–20, contents and dedication. 1982. Martinus Nijhoff, BV, The Hague, Netherlands. $63.00.—Historically, no other group of ferns has been subjected to such varied circumscriptions, both of the family and genera; moreover, species have been notoriously under-collected, ill-defined and confused, and their relationships misunderstood. Part of the reason is their mundane (cringe) and superficially similar look that causes collectors to sample one or a few and pass by the rest. Another reason is that few taxonomists have bothered to look at them closely. The first who did look was Carl Christensen, to whom Holttum appropriately dedicates this volume; but Christensen concerned himself mostly with Neotropical species. In 1963, Ching presented a revised classification of Old World genera that provided a springboard for Holttum's many precursory revisions culminating in the present work.

The sheer size and complexity of Thelypteridaceae have made Holttum's task formidable. This family is probably the largest in ferns, with almost 1000 species. In the Flora Malesiana region alone Holttum treats 440 species in 22 genera. The number of new taxa (75 species, 18 varieties) is staggering and reminds us how poorly known are the tropical floras and how urgent it is to preserve what little is left. In *Sphaerostephanos*, with 152 Malesian species, 43 are known only from the type and many additional species are not much better represented in herbaria.

But Holttum's most important contribution is not the number of species named and redefined; it is the understanding of the large natural groups of species. Here, he has brought order from chaos. Doubtless there will be taxonomists, including myself, who will prefer to assign lower rank to some of Holttum's genera. But his circumscriptions of natural groups are likely to survive intact or with only minor redefinition.

At least 13 new chromosome counts are embedded in the work; they may well be overlooked by compilers of chromosome indices. The most interesting, $n=66$ for a species of *Coryphopteris*, is a new base number ($x=33$) for Thelypteridaceae and may lend support to Holttum's contention of a relationship between this family and Cyatheaceae.

The magnitude, originality, and scholarship shown in this work are truly impressive and culminate a brilliant career. But Holttum is already turning to other ambitious projects and one wishes him many more years of taxonomic insight. *—Alan R. Smith, Herbarium, Department of Botany, University of California, Berkeley, CA 94720.*